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## SOME ASPECTS OF THE WATERWAYS QUESTION

Loose economic thinking is perhaps more characteristic of the literature of water transportation than of the literature of any other field of contemporary discussion. Whether in the writings and speeches of special interests, which hope to profit directly by the exploitation of particular waterway projects; or in the articles of those who gain a livelihood by contributions to popular magazines; or in the more thoughtful essays of reputable economists, examples in point are surprisingly numerous. The entire waterway propaganda, indeed, is shot through and through with almost every species of fallacious economic reasoning. It is not the purpose of the present article, however, to make an exhibit of the many cases that might be cited in proof of this statement, or to enter into a general discussion of the feasibility of water transportation.<sup>1</sup> But some of this faulty reasoning has been so persistent, and at the same time so prejudicial to a proper working-out of the transportation problem, that I am venturing to set forth here some of the more important aspects of the situation, and to restate my own conclusions on the points in question.

### I

The first argument relates to the many advantages of water transportation as compared with that by rail. Mere mention of a few of these advantages will be sufficient for the purpose of this discussion. The points most commonly advanced are, perhaps, the following: enormous carrying capacity of a waterway; the small space occupied by huge cargoes stored in barges; little friction of boats in water as compared with cars on steel rails; low haulage costs for given distances; and small expense of maintenance of the highway itself. Professor Emory R. Johnson in his book on *Ocean and Inland Water Transportation* has devoted a large portion of the discussion of inland waterways to an analysis of the

<sup>1</sup> For a full discussion of the question the reader is referred to *Waterways versus Railways*, by the author.

specific advantages possessed by water routes, and he concludes by implication, if not by precise statement, that with all these points in their favor there is no question as to the feasibility of rehabilitating our waterways.<sup>1</sup> It is a stock argument that waterways possess certain inherently "natural advantages" which cannot be undone or gainsaid; and that in consequence any analysis which arrives at a conclusion unfavorable to water transportation must necessarily be faulty.

This view appears to me to indicate an entire misconception of the nature of the problem. There may be a dozen advantages, natural or artificial, in water transportation, as against a single one in the case of railroads; the direct haulage cost may be but a fraction by water of what it is by rail; the expense of maintenance may be much less for a water than for a rail route;<sup>2</sup> and yet, after all, waterways may not be economically feasible. If the one advantage outweighs the twelve; if the outlays (costs) prove greater in the aggregate by water than by rail, the net advantage must obviously lie with the railroads. It is only by a comparison of totals, by a balancing of advantages and disadvantages, that we can obtain an approximation which is of practical value. This statement appears so commonplace as to be out of place in a magazine of this kind; and yet the principle has seldom been at the basis of waterways discussions, in whatever quarter. The failure to grasp the notion that a comparison of *total costs* can alone give an adequate basis for decision has all along beclouded the question

<sup>1</sup> Professor William J. Cunningham appears to strike a similar note in reviewing *Waterways versus Railways*, where he says: "There is evidence of a tendency, unconscious no doubt, to underestimate the natural advantages of waterways and to overestimate the superiority of railways" (*Journal of Political Economy*, XXI, 1 [January, 1913], 80). While Professor Cunningham apparently agrees with the general soundness of the conclusions reached, the implication contained in this reference to "natural advantages" indicates that the reviewer had lapsed into what I consider the common error of testing the feasibility of waterways by reference to specific advantages rather than by the balance of advantage and disadvantage. Professor Cunningham evidently implies that "natural advantages" *must* render some waterways feasible.

<sup>2</sup> This is not to admit that the waterways do possess these advantages to the extent mentioned. Indeed, many of the advantages claimed appear upon close analysis to be mere assumptions; they do not stand the test of careful analysis, and are often unsupported in fact.

of waterway feasibility. The problem cannot properly be approached from any standpoint but that of total costs; and until those who shall determine the future of our waterways accept this principle there is little chance that their determinations will prove other than unfortunate.

The only explanation for this persistent reference to the "natural advantages" of waterways appears to lie in the tacit assumption at the commencement of the discussion that water transportation is of undoubted feasibility, and that all that is necessary is to illustrate by reference to certain specific advantages why this is true. This assumption of feasibility appears, moreover, to be a survival from the days when canal and river transportation was of unquestioned value. Conclusions that were sound as applied to conditions when the stage-coach was the alternative to canal or river transportation, or when railways were new and untested, have been carried over and made to apply to conditions that are totally different. I cannot here go into the evidence for this belief. It must suffice to state that it finds abundant support in the transportation literature of the principal countries of Europe, as well as of the United States.

## II

The expression *total costs* as used in the preceding section requires some amplification. What should be included under the term? I have taken the stand in comparing waterways with railways that *total cost* should embrace for a government-supported waterway the following items: first, the direct haulage expenses, as covered by the rate charged the shipper on a toll-free route;<sup>1</sup> second, the cost of the maintenance and upkeep of the waterways; and, third, interest on the capital invested, together with a sinking fund for eventual amortization of the capital. I have not included a profit to the government on its investment, for a government is not necessarily concerned with profit. On the railway side of the equation I have assumed government railways for the purpose of

<sup>1</sup> In practice this usually includes a profit to the owner of the boat on his investment. Governments seldom act as carriers, but turn this function over to private interests who require a profit.

the comparison; and then included precisely the same items as in the case of waterways. By computing on this basis, the inclusive cost is found to be, for any kind of freight, always heavier by canal,<sup>1</sup> and almost always heavier by canalized river.

This manner of comparing transportation charges is evidently quite different from the common method of presenting tables of rates for given distances by rail and by water as all the evidence necessary. The water rates usually cover merely the direct haulage cost; whereas the rates on private railways cover for the traffic as a whole all the outlays listed above and an addition in the way of profit on the enterprise. The confusion of mind here evidently lies in the failure to distinguish cost to the shipper from cost to society at large. While it should be obvious enough that no part of the social cost can be eliminated by its mere transference from the shipper to the taxpayer, it is nevertheless true that the widespread belief in the cheapness of water transportation involves the unconscious acceptance of this very idea. In the early days of canal transportation the practice in every country was for the government, or for private individuals, to charge tolls sufficient to cover all the expenses of construction and maintenance of canals, as well as the direct expense of hauling given traffic for given distances. But since the development of modern railway facilities it has been necessary, in order to prevent the almost complete diversion of traffic from the waterways, for the governments to assume all, or nearly all, of the fixed charges connected with water transportation, to pay for building, equipping, and maintaining the water routes, and to furnish them free of charge to the owners of boats. When they are thus relieved of all save the mere direct cost of operating the boats, it is usually, though not always, possible for the water carriers to offer rates which enable them to compete with railways that are entirely self-supporting. The cost has in large measure thus been shifted to the taxpayers, and although the inclusive cost is usually much greater by water than by rail, those who look only at the rates charged the shippers still cling to the idea that waterways offer the cheapest means of transport known.

<sup>1</sup> I refer here to the typical inland canal, and would exclude the Panama and Suez, and such short connecting links as the St. Mary's Falls Canal.

There are one or two objections which are now and then offered in connection with the inclusion of the item of interest in determining the total costs of government waterways. The first of these embodies the popular idea that, somehow or other, if the government undertakes a public work of any kind, no return whatever is necessary on the capital invested. The answer to this, of course, is that the sum the government has to pay for the use of the capital it employs constitutes the obvious interest charge that must be met.

Another objection advanced with more claim to recognition has appeared in a review of *Waterways versus Railways*, by Professor Hess, who states with reference to the method employed in computing costs: "Not all are agreed that public enterprise and private undertakings should be placed in the same category in the matter of returns to capital or the earning of interest. If, as some believe, interest is a derivative of the subjective affinity of individuals for value, Mr. Moulton's reasoning touching the attitude of public policy toward waterway development is theoretically fallacious."<sup>1</sup> If I understand correctly the import of this statement, the writer is giving expression to the doctrine that the interest rate of individuals is different from that of society, which views interest through the eyes of government. Even if we grant this doctrine to be theoretically sound, there are nevertheless two practical answers to it, so far as the case in hand is concerned. Suppose the social interest rate to be 1 per cent, or even zero, and the rate in the competitive market to be 3 per cent: does this rule out interest from the computation of cost on a government waterway? Obviously, only in case it can be shown that the government can borrow the capital for the enterprise for nothing or for 1 per cent, that is, at the social rate, instead of the competitive market rate. This is answer enough. The argument falls down, however, in another way. I have assumed government railways for the purpose of comparison with government waterways; and consequently if we rule out interest in the one case we shall have to rule it out in the other; and the comparison would therefore not be vitiated in the least.

<sup>1</sup> *American Economic Review*, September, 1913, p. 655.

## III

Another phase of the problem that is badly in need of restatement relates to the so-called incidental and allied benefits of water transportation. When forced to the wall in the matter of comparative costs by water and by rail, the advocate of waterways promptly retires to what he considers the impregnable position afforded by the indirect and allied benefits of water transportation. These, in his opinion, furnish a final refutation of the argument of his opponent. For instance, while my own conclusions as to the comparative costs of rail and water transportation appear to have met with very general acceptance, there has been much reluctance in certain quarters to receive the analysis as conclusive evidence against the feasibility of waterway development. Reservation is usually made in the case of natural waterways, at least, as distinguished from canals. This is because it is believed that I have overlooked the indirect and allied benefits of waterways. Let us analyze the case.

It is necessary that we distinguish first between types of indirect benefits. They may be divided into two classes: transportation benefits, and non-transportation or allied benefits. By the latter is meant such gains as would come from the development of water-power, the prevention of the periodic wastes in consequence of floods, and the reclamation of low-lying riparian lands. In a still broader way the problem of river control is bound up with the whole program embraced by the term conservation of natural resources. Waterways, water-power, forestry, irrigation, reclamation of desert and flooded lands should go hand in hand and be apprehended as one comprehensive problem for the nation to solve. This theory must be regarded as usually pertinent in connection with river improvements, though seldom so in the case of canals; and I am in hearty sympathy with the viewpoint, provided that it is not assumed that the cost of the waterway improvement will be covered in full by the purely transportation gains which accrue, and that the allied benefits will therefore be so much net gain to society. Unfortunately this has been the almost universal assumption of waterway advocates—an assumption, again, which is based on the belief that water transportation costs less than transportation

by rail. But if I am correct in my investigation of the Mississippi River, for instance, showing that extensive improvement for transportation purposes would be economically wasteful, it follows that the related aspects of the problem must be viewed in a quite different light. It may conceivably be the case that the improvement of the Mississippi River can still be proved warrantable as a part of a general conservation project; but to prove this involves showing that the gains on these non-transportation grounds would in the main be sufficient to cover the expenditures involved. If the transportation side of the problem thus becomes subsidiary, the engineers must conduct their investigations in ways different from what was appropriate when transportation was the first consideration. To take one case only, the reclamation of swamp lands and the prevention of floods might not require the construction of a fourteen- or a twenty-four-foot channel, or the erection of gigantic locks such as many consider necessary for transportation purposes. Levees alone, constructed at relatively small cost, might prove entirely adequate. Incidentally, the river thus regulated would afford some transportation facilities. It is possible, also, that a comparatively small *additional* expense would result in a considerable increase of traffic. Hence transportation should still enter as a factor. But in any event it is clear that the problem has to be quite differently conceived when transportation is not the chief end sought, or when the direct benefits of transportation are not sufficient to warrant the project. There is need of some thorough-going investigation that will differentiate these aspects of the question.

The class of indirect gains from waterway development, which I have designated as *transportation benefits*, may be summarily treated. The benefits here referred to are the familiar ones which accompany quickened industrial activity from whatever cause. New factories spring up in consequence of low freight rates, and existing industries gain a new lease of life. This means an expansion of commerce, larger business, increased profits, higher wages, and widely diffused industrial prosperity. The point may be illustrated by reference to the discussion of inland waterways at the meeting of the American Economic Association in 1910. In



answer to the argument that Frankfort-on-the-Main had sustained an economic loss by making an expenditure upon the canalization of the river Main and the construction of a city harbor several times greater than would have been required to provide railway facilities of equal capacity,<sup>1</sup> Professor Emory R. Johnson replied that this contention overlooked a very important point, namely, that the canalization of the river had resulted in a very great industrial development in Frankfort, the benefits of which were more than ample to cover the cost of the enterprise.<sup>2</sup> The same argument has been repeatedly made by Professor Goode and other writers with reference to the general development of trade in Manchester following the opening of the Manchester Ship Canal. Professor Johnson has it in mind again, in his recent report to the government on Panama Canal traffic and tolls. In discussing the principles which should govern the fixing of tolls he takes the following position:

The commercial usefulness of the waterway should be given first consideration. Tolls may wisely be imposed to secure revenue, but the transit dues must not prevent the canal from fulfilling its primary function. . . . The Canal should be commercially self-supporting, provided revenue large enough to enable the Canal to carry itself can be secured without unwisely restricting traffic.<sup>3</sup>

The restriction of traffic because of high tolls would, it seems, obviously restrict the allied benefits which come with quickened industry. Reduce these tolls in part, and, regardless of who makes up the deficit, business is benefited. It ought to follow that no tolls at all would be better, or, to carry the point to an absurdity, that a bonus would be best of all. It would seem that by some hocus-pocus the social cost of carrying goods is in this way annihilated.

These indirect benefits can arise only through the medium of a reduced cost of transportation; and if railway transportation, all factors considered, proves cheaper than water transportation, the argument consequently falls to the ground. In the case of the

<sup>1</sup> Twenty-third annual meeting, *Papers and Discussions*, Fourth Series, No. 2.

<sup>2</sup> Stated in a personal conference.

<sup>3</sup> *Panama Canal Traffic and Tolls*, p. 193.

Panama Canal, if sufficient traffic does not develop, in the long run, to permit the paying of interest on the capital and to provide a sinking fund for its eventual amortization, this will be concrete evidence that the shippers, for reasons of economy, prefer other means of transport; and it follows that greater industrial development would have been secured by other means.<sup>1</sup> In the other cases cited, computations made by the writer appear to have proved beyond question that greater benefits could have been secured by railway construction, than by the course followed. A government waterway, to be adjudged economically feasible, must in the end *be able* to pay for itself. There may be circumstances, it is true, which would justify charging less than enough to cover cost, but if the waterway is *unable* to pay for itself through the charging of tolls, it might better not have been constructed, so far as commercial interests are concerned.

The error into which writers have fallen in this connection appears to be due in part to a failure to appreciate the fact that the gains which accrue to shippers are offset by losses to the taxpayers, who make good the balance of the cost involved. No part of the cost can be eliminated merely by dividing it, a part being paid by the shippers and a part by the general public in the form of taxes. The whole community can benefit only in case the inclusive social cost is lessened. True, a given section of the country may reap an advantage as the result of a policy which shifts a part of the cost to outsiders, and many local projects appear to have been inspired by this desire to profit at the expense of others. But economists and other public writers in favor of waterways have a national or social point of view—the community as a whole is to be benefited. In the case of Frankfort and of Manchester, moreover, the cost was not to be shifted to any appreciable extent to outsiders. Manchester had no state aid and Frankfort relatively little. It was, practically speaking, merely a question of relative efficiency of railways and waterways.

The fallacy under consideration is also in part traceable, again,

<sup>1</sup> The writer is here expressing no opinion as to the economic feasibility of the Panama Canal in fact, but only challenging a principle for testing its ultimate success as a commercial enterprise.

to the assumption of the fundamental cheapness of water transportation. This attitude, moreover, is an excellent illustration of the tenacity with which people sometimes hold to conclusions long after the conditions that gave them validity have ceased to exist. The construction of the Erie Canal in the early days resulted in a tremendous cheapening of the cost of moving goods across the divide, and was of untold benefit to all the region tributary to it; but the alternative method of transportation was then the overland wagon route, and not the railroad of the present day. To construct a canal today almost invariably means to raise rather than lower the cost of transportation.

A word should be said here with reference to the argument so frequently advanced by waterway advocates that the potential competition afforded by waterways renders them advisable even if the actual competition does not. Granted that the cost of water transportation is greater, may not the improvement of waterways still be justified as a means of compelling more favorable rail rates?<sup>1</sup> The theoretical answer to this argument is that if the government has to resort to direct competition with railroads in order to prevent exorbitant charges, it should do so in the most economical manner, namely, through the construction of government railways. But, it is urged, while this argument may be practicable so far as continental Europe is concerned, where government railways are an accomplished fact, it is quite inapplicable to the problem in the United States because of the prejudice which exists against government railways. Government waterways, on the other hand, are looked upon with favor, and hence potential water competition is the only practical alternative. While it is undoubtedly true that competition through government railways is out of the question in the United States, it does not follow that the only escape from exorbitant railway charges lies in potential water competition. Most of us are unwilling to admit that the government is unable through the Interstate Commerce Commission and the courts to prevent exorbitant freight rates. Why spend hundreds of millions in the construction of water-

<sup>1</sup> They can obviously serve as potential competitors only in case the indirect cost is in the main defrayed by the government.

ways for *potential competition* when low rates can be enforced directly at a mere fraction of the cost?

#### IV

There is one final aspect of the problem to be briefly developed. It has to do in part with the problem of congestion of traffic on the railroads, and in part with a consideration of the ultimate need of water transportation facilities. The argument that the capacity of the railways is greatly overtaxed at certain times of the year and that water routes have become indispensable to the relief of traffic congestion has been widely exploited. It can be readily shown, however, that the argument is practically without foundation. This is not because there is, in point of fact, no congestion of traffic, but because waterways are seldom the best means of alleviating it.

In the first place, it is generally the case that the use of waterways customarily involves one or more transshipments of cargo, from rail to water, or vice versa, in the shipping centers. Exceptions to this are found only where the source and destination of the traffic are both immediately along the water route. The use of railroads, on the other hand, never necessitates a transshipment of cargo, but merely the switching of a car or train from one track to another. Since the congestion exists mainly in the shipping centers, it is evident that this transferring of cargo would serve rather to augment than to diminish the congestion within the crowded area.

This argument of traffic congestion was a determining factor in the recent construction of canals in the Westphalian industrial region of Germany. The traffic had become so dense there that, in the view of the administration, the traffic could no longer possibly be handled by the railroads alone, and canals to supplement the railroads were absolutely indispensable. In considering this situation it should be noted, first, that practically all the traffic of the region must travel over the railways for at least a part of the distance to market, even when waterways are employed. Coal, for instance, which constitutes the great bulk of the waterway traffic of the region, must all be brought from the mines to the

waterways by rail because it is out of the question to run water lines to the very opening of the mines. The Germans always use the railways as feeders to the water routes. Observe, then, that if the traffic were doubled, let us say in the next ten years, it would require a doubling of the railway capacity between the mines and the waterways. (This is evidently not deemed impossible.) The territory adjacent to the mines, however, is the region of the very densest traffic, because the farther one goes from the mines the more the railway lines tend to spread out rather than to converge. It appears, therefore, that the waterways are designed to relieve the congestion only where it is needed least. The actual result of the policy is to increase rather than to diminish the congestion of the district. When transshipments to waterways are made, the cars must remain within the congested area while being switched and unloaded; but if the railroads alone were used the cars would pass beyond the borders of the congested area without stopping, thus serving to relieve the tension. At Dortmund one may see a score of trainloads of coal standing on the tracks waiting to be unloaded. Were they sent directly to their destination the congestion of the district would be measurably relieved.

The argument under consideration also carries with it the underlying assumption that the traffic capacity of a canal is much greater than that of a railway in proportion to the ground space occupied; and that in consequence as the traffic of a region becomes very dense, sheer lack of space compels the resort to canals. Though widely accepted, this assumption appears to be quite without foundation in fact. Two German writers have computed the carrying capacity of an all-freight double-track railway to be much greater than that of a 600-ton barge canal;<sup>1</sup> while the present writer's computations have shown that, in proportion to the ground space occupied, the potential capacity of such a railroad is several times that of a 1,000-ton barge canal.<sup>2</sup> The assumption to the contrary has been supported only by the unequal comparison of the *actual* tonnage handled on railways that are devoted partly to passenger traffic, on the one hand, with the theoretical maximum capacity of

<sup>1</sup> Rathenau und Cauer, *Massengüterbahnen*, pp. 83-84.

<sup>2</sup> *Waterways versus Railways*, pp. 236-40 and 432-34.

canal locks, on the other—assuming traffic to be moving only in one direction, and in a practically continuous stream.

In this argument I have been speaking of canals only. In the case of a river the argument does not apply with quite the same force. With a river, the ground space, so to speak, is occupied whether the river is used or not. Its utilization, therefore, means the utilization of space which could not be used for railway building, or other purpose. One can argue, therefore, that where a river lies in the pathway of traffic and the railways have already been extensively developed, the utilization of space occupied by the river becomes a matter of much importance. If, indeed, it should become physically impossible to develop additional railway carrying capacity, resort to the water routes would be obviously desirable. And even before such a situation were reached it would doubtless be profitable to resort to the river because of the alternative use to which the land might be put. For the sake of its utilization in agriculture or for industrial purposes, it would be better to forego the use of this land for railway construction even though the rail transportation were still somewhat cheaper in other respects than that by river. While this argument is undoubtedly sound, it is nevertheless of rather limited application. The use of a river will not serve to relieve the congestion of traffic where relief is most required. The greater part of the freight that could be carried on the river—practically all of the coal and agricultural produce, for instance—has its origin off the river; and, in consequence, would still have to be carried a part of the distance by rail. Only on strictly riparian traffic can a river serve as a relief to railway congestion.

Taking a long look forward to the future may it not be argued, however, that, inasmuch as a time will eventually come when river space must be used for transportation purposes, we should begin at once to encourage river traffic, and not wait for the compelling force of necessity? This is, in a way, a species of infant industry argument: support for a time what will one day be able to support itself; encourage and hasten the development of what is destined ultimately to prove profitable; if river transportation is properly encouraged the balance of advantage will the sooner pass from the

railways to it. Granting the theoretical soundness of this position, how urgent in fact is the need for river transportation, and how imminent is the day when it will be economically feasible? No general answer to this can be given, for it will obviously vary with different rivers, depending in each case upon the cost of the regulation works required to make the river navigable. It will depend also in a very emphatic way upon the rapidity with which railways will come to operate under conditions of diminishing returns. In the writer's opinion the possibilities of reducing railway costs per unit of traffic that come with the development of double and quadruple track systems are so great that the day is far removed when river transportation in general will economically supersede rail transportation.

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